

# MRS: The strange matter of materials science

Materials science shapes the world as we know it. **Dr Todd Osman** has dedicated his career to advancing this interdisciplinary field and, as Executive Director of the Materials Research Society, he is keen to inspire people to engage with the wide range of world-class research in this area. He recently spoke to us at *Research Features* to discuss his organisation's recent successes within materials science, before highlighting the direction he would like to see research go in the future.

Some of the greatest landmarks across the world only exist because of materials science. Whether it be Sydney Harbour Bridge, the Eiffel Tower or a simple wine glass, materials science has shaped modern-day life as we know it.

Behind each material is a story – a whole host of scientific work dedicated to establishing the structural and mechanical components of life's building blocks. At the forefront of this work is the Materials Research Society (MRS), a non-profit Pennsylvania-based organisation which has been responsible for getting materials research seen and heard by the masses, through various TV shows, museum exhibits and interactive games.

MRS's philosophy is to advance materials research and, consequently, improve the quality of life of people around the world. *Research Features* recently spoke with its Executive Director, Dr Todd Osman, to discuss this further, and determine why materials science remains such an important area of research and development.

*Hi Todd! Thank you for speaking with us today. How would you describe your role as Executive Director of the Materials Research Society (MRS) and what kind of responsibilities do you have?*

Quite simply, I have three primary roles as Executive Director: 1) to facilitate the work of the society; 2) to infuse our mission, vision

and values into all that we do; and 3) to ensure the long-term vibrancy and relevancy of the society.

*Could you tell us more about MRS's background and the kind of work into materials science that you do there?*

Rustum Roy, one of MRS's founding members, stated that 'in the very first meeting (1973) of the Materials Research Society, we stressed our hope that the MRS would become the international society in interdisciplinary materials research'. From our founding until today, we have focused on the field of materials research, engaging physicists, chemists and engineers alike. 48% of our members hail from outside of the United States, with 50% of attendees at a recent MRS Fall Meeting travelling internationally to convene with their peers. Whether it be our meetings, publications, or our numerous other programmes, we simply aim to fulfil our vision, 'providing a framework in which the materials disciplines can convene, collaborate, integrate and advocate'.

*MRS has members from academia, industry and government. How important is it to have worldwide collaborations with other research institutions, especially in terms of enhancing materials research and developing next generation devices?*

Connecting people and facilitating the cross-pollination of ideas locally and globally is at the heart of today's research and development enterprise. In his book



NanoDays is a national week of community-based educational outreach events to raise public awareness of nanoscale science and engineering and its potential impact on the future. Photo courtesy of the Materials Research Society Foundation.

*The Medici Effect*, Frans Johansson defines innovation as occurring best when engaging diverse backgrounds, industries, cultures, and disciplines. Students travel abroad to study. Multinational corporations manage technological developments across continents with global and local partners. Research programmes are established between international institutions, leveraging expertise and unique equipment that each possesses. These global interactions and collaborations catalyse materials research,

creating new ideas and approaches to meet local needs as well as global demand.

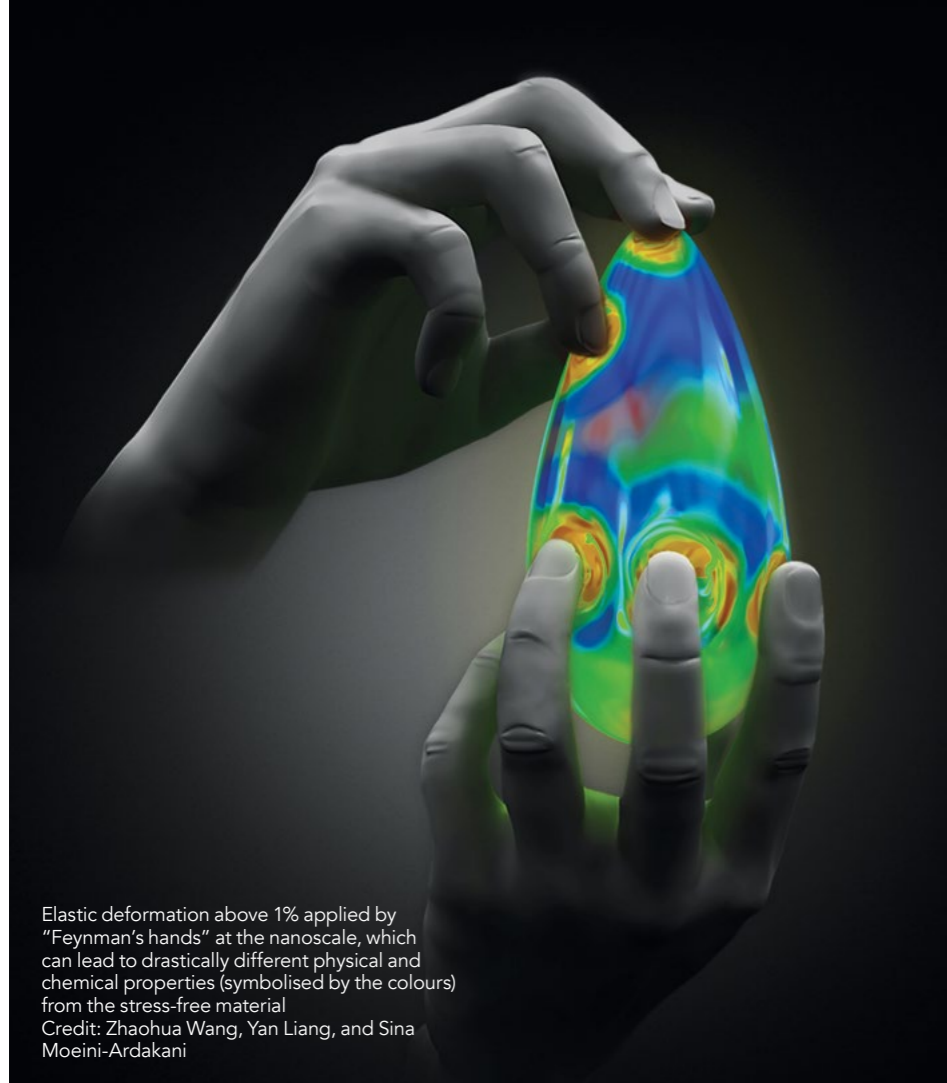
*What impact do you think MRS has had on materials science since its establishment? Are there any personal accomplishments you are particularly proud of?*

Let me start with a quote from an article written in celebration of the Society's 40th anniversary: "MRS's success is a story of the people who opened the doors to interdisciplinary inquiry and those who

subsequently charted a path that led to remarkable research advances, professional partnerships, and public appreciation for the role of materials in our lives. These individuals – with their openness to and respect for new ideas and directions, entrepreneurial spirit, and commitment to excellence – created a very special and enduring MRS culture." I'm not sure I could say it much better than that. MRS's global, interdisciplinary focus was novel for a scientific society when we were founded, but definitely aligns with how materials

**Materials have changed our history and continue to shape our future**





Elastic deformation above 1% applied by "Feynman's hands" at the nanoscale, which can lead to drastically different physical and chemical properties (symbolised by the colours) from the stress-free material  
Credit: Zhaohua Wang, Yan Liang, and Sina Moeini-Ardakani

research is conducted today. In the past 43 years, the world has become increasingly more interconnected and research increasingly more collaborative, spanning disciplines, institutions and continents. MRS was on the vanguard of those philosophies in 1973 and continues to explore, identify and respond to the evolving needs of our community.

**Does materials science research receive as much funding and recognition as it should?** Materials are at the heart of every major technology, and there has been an increasing recognition that our critical societal challenges will require new materials and/or advanced manufacturing techniques to more efficiently produce materials. These developments will increasingly require funding, support and investment, both from public and private sectors. Beyond funding,

and like all fields of science and engineering, there is a need to better communicate the importance of materials to the public and to the next generation of students.

The *Making Stuff* television series (a four-part PBS primetime series on materials science, coproduced by MRS and NOVA) and Strange Matter museum exhibits (an interactive travelling exhibit, developed by MRS in partnership with the National Science Foundation (NSF) and the Ontario Science Centre) aim to engage the public around the importance of materials and science. And our Impact of Materials on Society university course is designed to expand the social literacy of scientists and engineers, as well as the technical literacy of humanities and social science students, all by exploring how science, engineering and society are interrelated.

## Connecting people and facilitating the cross-pollination of ideas locally and globally is at the heart of today's research and development enterprise



The Hagamos con-Ciencia outreach programme exposes 5<sup>th</sup> and 6<sup>th</sup> grade students in rural and/or impoverished areas of Mexico to the excitement of science and technology  
Photo courtesy of the Materials Research Society Foundation

**Within MRS, you have the Materials Research Society Foundation. Could you tell us some more about what this is and why you decided to set it up?**

MRS's mission calls for us to advance interdisciplinary materials research and technology to improve the quality of life. We founded the Materials Research Society Foundation in 2012 to build upon our tradition of public and STEM (science, technology, engineering, and mathematics) education outreach programmes and to better support our mission. Our Foundation seeks to leverage grants, donations and corporate sponsorships to serve the needs of the materials community, utilising the Foundation to accomplish more together than any one group can do alone. Through the Foundation, we have been able to increase the number of grants awarded to our members for outreach projects in their communities. We have expanded the Broadening Participation in Materials programmes to better engage underrepresented groups. Our Focus on Sustainability efforts have also grown dramatically, raising awareness of the nexus between materials, materials research, and sustainable practices.

**Why are grassroots initiatives and programmes, such as MRS University Chapters and the Strange Matter travelling museum exhibits, so important for enhancing materials research within the community?**

**What impact have these initiatives had?**

Our education outreach programmes are important to catalyse the visibility, engagement and impact of science and technology. Our Strange Matter museum exhibitions have attracted over 5.3 million visitors in North America, Latin America, Asia and the Middle East. The Materials Research Society Foundation has supported Polycraft\* to engage the next generation of science students via on-line gaming, and Hagamos con-Ciencia, for outreach to elementary school children in rural Mexico. Likewise, the Foundation has supported SciBridge, a programme connecting students in Africa to materials scientists in the United States, and Chemistry on Computers in Kenya, a project that develops computer-based materials chemistry curriculums for secondary school labs.

The majority of our Foundation grants are proposed and conducted by MRS University Chapters. These students are passionate and talented and represent universities from around the world. For them, the benefits are twofold. They play a vital role in bringing research out of the laboratory and into classrooms and to the general public – raising interest in materials science and how it impacts our daily lives, and in turn, inspiring the next generation to consider STEM careers. At the same time, these projects help prepare our Chapter students for future

professional and leadership roles in the materials community.

**In what direction would you like to see materials science research going over the next ten years and how will MRS's research strategy play into this?**

The key global challenges of the 21<sup>st</sup> century – developing green energy and transportation, guaranteeing clean drinking water, engineering innovative biomedical devices, and advancing a new generation of computation and communication – all require materials solutions.

We are fortunate that our membership includes women and men from more than 90 countries, and that they bring with them a rich and varied background of skills, knowledge and viewpoints. If we continue to honour the MRS mission and vision, then our role is to connect these people and their ideas, and draw on the wisdom that this diverse community can provide. Together, we will play a critical role not only in developing solutions to these key challenges, but also in communicating and disseminating these advancements to the global community. And of course, we'll continue to advocate for sustainable funding of science, provide forums for public-policy discussion, support STEM education initiatives and play a significant role in developing and nurturing the next generation of materials scientists.

Materials have changed our history and continue to shape our future. We expect an exciting decade ahead and feel confident that MRS is well positioned to lead the way – advancing materials and improving the quality of life.

\* Polycraft is an educational technology which adds additional materials and tools to the basic Minecraft online game. The add-ons have a chemistry and engineering focus and behave in a scientifically accurate way.

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